Rhodora

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THE GENUS SYNTHLIPSIS (CRUCIFERAE)

REED C. ROLLINS

Accepted genera of the Cruciferae are often very closely related to one another and it is never quite safe to take for granted the unequivocal reference of a given species to a particular genus. This situation frequently makes the problem of generic limits a particularly difficult one and it is often the case that a given species may be recognized without difficulty, while the reasonable placement of it in a genus is a matter of considerable uncertainty. The problem-species, in this respect, are the ones somewhat at the fringe of the genus and which have characteristics that deviate from those possessed by the more centrally located species. While these species are problems to the classificationist, they are at the same time crucially important to the evolutionist who searches for evidences of the pathways by which genera may be interconnected and thus display possible evolutionary lines linking one genus with another.

In studying the genus *Lesquerella*, I have sought to discover the connections of this genus with others in the family and one of the most obvious is that shown by *L. lasiocarpa* with *Synthlipsis* (cf. Rollins, 1955). In the earlier literature, this relationship is pointed up by the fact that Gray (1859) originally described *L. lasiocarpa* var. *Berlandieri* as

Synthlipsis Berlandieri. Furthermore, the inadequacy of material, coupled with the wide range of variation present in *L. lasiocarpa* as a whole, misled Watson (1882) into describing *Synthlipsis heterochroma* and *S. Berlandieri* var. *hispida*. The variants thus recognized by Watson are now accommodated in the four varieties of *L. lasiocarpa* (Rollins, l.c.), but it is more than probable that the last word on the taxonomy of the group has not been written. Additional material, particularly from eastern Mexico, should ultimately provide a more adequate basis for an understanding of this particular species in its entirety. In any event, the tie between the genera *Lesquerella* and *Synthlipsis* is clearly revealed through the characteristics of what is now called *Lesquerella lasiocarpa*.

In considering *Synthlipsis* alone, one of the major questions has been whether, with its single species, it did in fact, represent a genus sufficiently different from other genera of the family to merit continued recognition. Earlier (Rollins, 1939), we presented evidence for retaining *Synthlipsis* as against merging *Nerisyrenia* with it. In reviewing this evidence, I am less firmly convinced that the bases for keeping *Synthlipsis* and *Nerisyrenia* apart are unequivocal because some of the differences previously enumerated do not stand up in light of the data obtained from more recent collections of *Synthlipsis*. We are still in need of a broader spectrum of information than is at present available or even possible until further material is obtained. However, it does not seem probable that the merging of *Nerisyrenia* with *Synthlipsis* will be fully supported even with more material for study.

Up to the present, it has not been possible to consider the genus *Synthlipsis* in any context different from that of a single known species, *S. Greggii*. However, in the last few years considerable additional material of the genus has been collected, bringing to light two previously undescribed species. The siliques of all three species are strongly compressed at right angles to the replum, they are carinate-margined, possess a deep V- or U-shaped notch at the apex

and are densely pubescent with multiple-branched trichomes. These and other characteristics provide the members of the genus with a certain unity not shared by any other known species of the Cruciferae.

One of the new species described below, *Synthlipsis elata*, shows some resemblance in general habit to *Mancoa pubens*. This led to a consideration of the position of *M. pubens* in *Mancoa* and opened the question as to its possible inclusion as a member of *Synthlipsis*. However, *M. pubens*, although a somewhat anomalous species in *Mancoa*, seems better left in that genus for the present.

The following synopsis brings up to date the information we have concerning the genus *Synthlipsis*.

KEY TO THE SPECIES

Infructescences elongated, 1-4 dm. long; caudex not thick and heavily clothed with old leaf-bases; sinus at base of style open; styles pubescent or glabrous.

Siliques 2.5-3.5 mm. wide, narrowly oblong; ovules 15-25 in each locule; petals obovate, 4-5 mm. long ..... 1. *S. elata.*

Siliques 6-8 mm. wide, broadly elliptical; ovules 7-11 in each locule; petals broadly obovate, 9-12 mm. long. ..... 2. *S. Greggii.*

Infructescences compact, 2-5 cm. long; roots thick, caudex clothed with old leaf-bases; sinus at base of style narrow, nearly closed; styles glabrous throughout ..... 3. *S. densiflora.*

1. Synthlipsis elata Rollins, sp. nov. Fig. 1A-1F.

Annual; stems erect, divaricately branched from base upward, densely pubescent with dendritically branched trichomes, 4-6 dm. long; branches ascending; lower leaves narrowed at base, scarcely petiolate, 5-10 cm. long; 1-2 cm. wide; upper leaves sessile, 2-4 cm. long, 5-8 mm. wide; all leaves irregularly dentate to nearly pinnate, densely pubescent with stellate and dendritic trichomes, strongly 1-nerved on the lower surface, narrowly oblong, acute; inflorescence racemose, elongating in fruit, 1-3 dm. long; sepals nonsaccate, oblong, densely pubescent, ca. 2.5 mm. long, ca. 1.2 mm. wide; petals white, obovate, differentiated into blade and claw, entire, not dilated below, 4-5 mm. long, 2-2.5 mm. wide; filaments not dilated at base, 4-5 mm. long; anthers ca 1.5 mm. long; pedicels divaricately ascending, straight, densely pubescent, very slightly expanded at summit, 6-10 mm. long; siliques narrowly oblong, strongly compressed at right angles to septum, carinate-margined, notched at apex, densely pubescent, 8-12 mm. long,

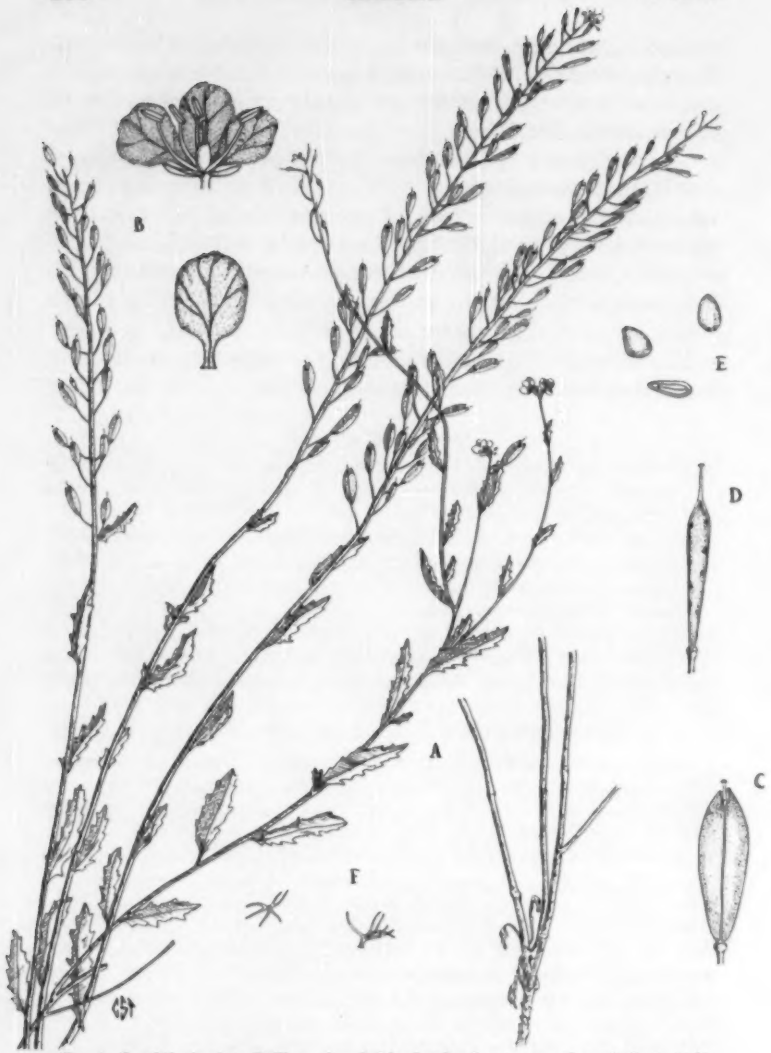

FIG. 1. *Synthlipsis elata* Rollins. A — habit sketch of upper portion of plant, × ½; B — flower with some parts removed and single petal, × 3; C — mature silique, × 3; D — replum, × 3; E — seeds, × 5; one seed in cross-section to show cotyledon position in one of the most compressed types, × 10; F — trichomes, × 25.

2.5-3.5 mm. wide, apical notch V-shaped, shoulders acute; styles slender, pubescent at base, 2-2.5 mm. long; stigma capitate, discoid to slightly bifid; ovules 15-25 in each loculus; seeds plump, often angular, wingless, mucilaginous when wetted, 1.1-1.3 mm. long, ca. 0.75 mm. broad; cotyledons incumbent to accumbent.

Herba annua; caulibus erectis ramosis pubescentibus 4-6 dm. longis; foliis anguste oblongis acutis dentatis vel sinuatis ad basi cuneatis 1-nervatis dense pubescentibus; inflorescentiis racemosis elongatis; infructescentiis 1-3 dm. longis; sepalis nonsaccatis oblongis pubescentibus ca. 2.5 mm. longis, ca. 1-2 mm. latis; petalis albis obovatis 4-5 mm. longis, 2-2.5 mm. latis; pedicellis divaricatis rectis pubescentibus 6-10 mm. longis; siliquis anguste oblongis compressis carinatis pubescentibus 8-12 mm. longis, 2.5-3.5 mm. latis; loculis 15-25-ovulatis; seminibus emarginatis brunneis 1.1-1.3 mm. longis, ca. 0.75 mm. latis; cotyledonibus incumbentibus vel accumbentibus.

Type in the Gray Herbarium, collected on rocky slope, 9 miles northeast of Durango, Route 31, Durango, Mexico, 25 July, 1958, *D. S. Correll and I. M. Johnston 20149*. Isotype at the Lundell Herbarium (TRF).

Synthlipsis elata has considerably narrower siliques and very much smaller flowers than either *S. Greggii* or *S. densiflora*. The pedicels are rather rigidly divaricate and only slightly ascending, giving a somewhat rigid appearance to the infructescence. Another striking feature is the very slender style which broadens very slightly at the base where a few branched trichomes are present. The plants of *S. elata* are virgately branched, the major branches beginning just above the soil line and branching repeatedly upward and outward. The tap root is well developed, but appears not to be that of a perennial plant.

The numerous small seeds are crowded in the loculi of the siliques and the shape of each seed is somewhat determined by pressure from adjacent seeds. This crowding also affects the position of the cotyledons with respect to the radicle. They are basically incumbent but often are crowded into an oblique to nearly accumbent position.

S. elata differs from *S. Greggii* and *S. densiflora* in having numerous seeds and incumbent cotyledons. In these features, it is more like *Nerisyrenia* than the other species of *Synthlipsis*.

2. Synthlipsis Greggii Gray, Mem. Am. Acad. 4:116. 1849.

Annual or biennial, possibly perennial; stems numerous from a slender or thickened caudex, densely covered with whitish dendritically branched trichomes, simple below, branched above, weak, often decumbent or sprawling in nearby bushes, 2-7 dm. long; leaves petiolate, densely pubescent with multiple-branched trichomes, mid-vein conspicuous; basal and cauline leaves basically similar; basal leaves with a slender petiole, broadly oblong or obovate to nearly spatulate, acute to somewhat rounded at apex, deeply dentate to nearly entire, 2-14 cm. long, 1-4 cm. wide; cauline leaves short-petiolate to cuneate at base and nearly sessile, oblong to broadly obovate, deeply lobed to shallowly dentate, acute to somewhat rounded at apex, 1-6 cm. long, 5-30 mm. wide; inflorescence much elongated, 1-4 dm. long; sepals narrowly oblong, nonsaccate, densely pubescent, 5-8 mm. long, 1.5-2 mm. wide; petals white to violet, broadly obovate, 9-12 mm. long, 6-9 mm. wide; filaments slender, not dilated at base; anthers oblong, 3-3.5 mm. long; fruiting pedicels widely spreading to slightly recurved, often somewhat sigmoid, 5-15 mm. long, slightly flattened in same plane as fruit, densely pubescent; siliques strongly flattened at right angles to replum, carinate-margined, elliptical to broadly oblong, densely pubescent, 8-15 mm. long, 5-8 mm. wide, apical notch shallowly to deeply U-shaped, more rarely V-shaped; styles slender, glabrous, 2-5 mm. long; ovules 7-11 in each locule; seeds plump, wingless, slightly longer than broad, 1.5-2 mm. long; cotyledons accumbent.

KEY TO VARIETIES

Siliques more or less uniformly pubescent with multiple-branched short-stalked trichomes ..... 2a. var. *Greggii*.
Siliques hispid with long-stalked trichomes and pubescent with an understory of multiple-branched short-stalked trichomes ..... 2b. var. *hispidula*.

2a. S. Greggii var. Greggii. Fig. 2A-2F.

Variety *Greggii* is distributed from southwestern Texas south and west into Mexico, reaching the southern extremity of its known range in Hidalgo and its westward limit in the state of Durango. The area of occurrence in Hidalgo in

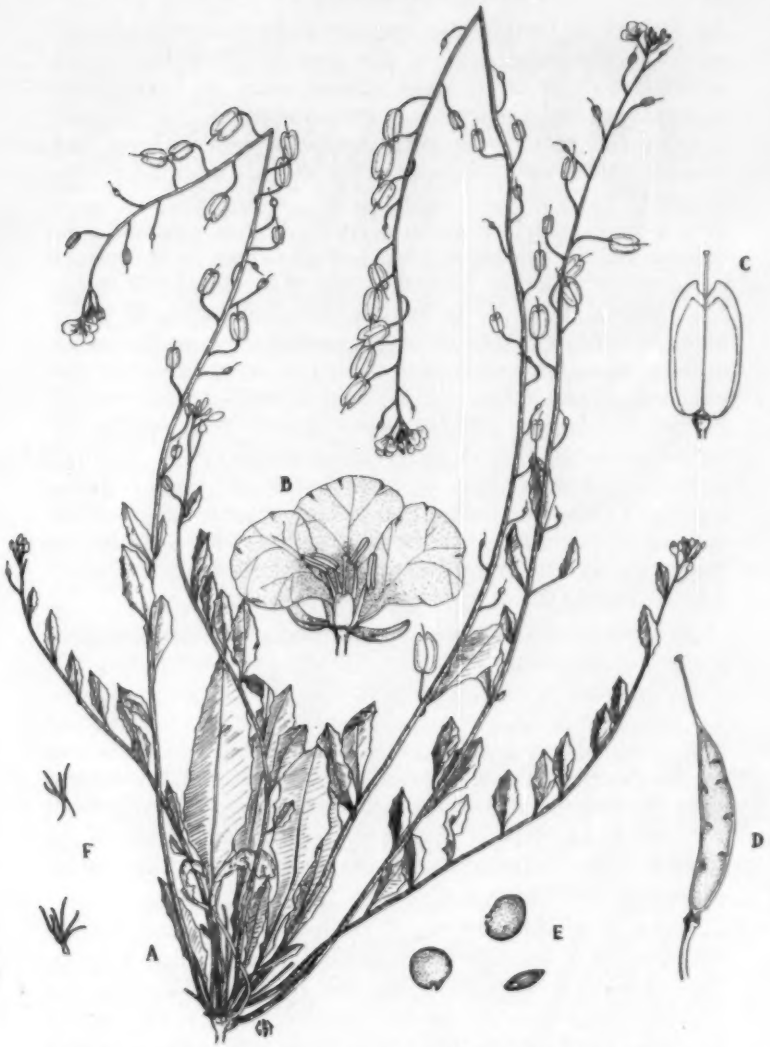

FIG. 2. *Synthlipsis Greggii* Gray. A — habit sketch, × ½; B — flower with some parts removed, × 2; C — mature silique, × 2; D — replum, × 3; E — seeds, × 2.5. one seed in cross-section to show cotyledon position; F — trichomes, × 25.

the district of Ixmiquilpan appears to be isolated from the main distributional area of the species. This disjunction parallels that of other plant species, such as *Parthenium argentatum*, and apparently is not uncommon. Var *Greggii* is unusually variable in many morphological features and this variability may be associated with wide seasonal fluctuations in moisture and temperature. It flowers and fruits over a very long time-span, depending upon seasonal conditions, and the continued growth of any given plant appears to be under moisture control rather than seasonal domination. This is shown by the dates of collection of the 38 specimens in the Gray Herbarium. According to these, flowering or fruiting specimens were collected in every month of the year except December, and the absence of the latter month from the roster is probably pure chance. The number of collections taken in each month are as follows: Jan., 1; Feb., 3; Mar., 2; Apr., 4; May, 3; June, 3; July, 5; Aug., 4; Sept., 3; Oct., 4; Nov., 6. Taking the full geographic range of the species into account, there is no regular dormant season as far as growth is concerned and no period when flowering may not occur under appropriate conditions.

As a result of its tendency to grow whenever the moisture regime is favorable, *S. Greggii* may grow continuously for many months, producing greatly elongated flowering stems. On the other hand, a short moist period followed by a long dry one produces a short growth period which is followed by the slowing down and cessation of growth and a relatively dwarfed plant results. These extremes in the overall growth pattern are paralleled by leaf-size and other deviations which must be taken into account in any assessment of the variation of the species as a whole.

Growing in open ground, *S. Greggii* has a central tuft of basal leaves with decumbent sprawling stems that arise in their axils. Because the stems are weak and lie along the ground, the cauline leaves are oriented to the upper side of the stem, even though they are borne alternately. In heavily grazed areas, the plants of *S. Greggii* survive through the

protection of spiney bushes and cactus clumps where the stems are enmeshed among the branches or spines of the protecting clump.

Some populations of *S. Greggii* have pure white flowers. These usually become pale pink upon drying. But the commonest flower color is a light to dark shade of violet. Upon drying, the petals of many of these flowers become very deep violet in color.

In addition to the collections cited in my earlier paper (1939), the following have been studied: — **Texas**: Maravillas Creek, 44 miles southeast of Marathon, Brewster Co., *Cory 31618* (GH); between Persimmon Gap and Dog Flat, Brewster Co., *Warnock C293* (GH); La Joya, Hidalgo Co., *Mrs. E. J. Walker 27* (GH). **Mexico** — **Chihuahua**: Cañon del Rayo, Sierra del Diablo, *Stewart 854* (GH). **Tamaulipas**: San Fernando, *Berlandier 811* (GH). **Nuevo Leon**: 5 miles west of Santa Catarina toward Saltillo, *Rollins & Tryon 5893* (GH); south of La Paz, 80 miles south of Saltillo, *Rollins & Tryon 58171* (GH); near Pablillo, *Shreve & Tinkham 9746* (GH); 29 miles northeast of Saltillo on road to Monterrey, *Rollins & Tryon 58311* (GH). **Coahuila**: about 4 miles east of Carneros Pass, *Correll & Johnston 21328* (GH, TRF); south of Castaños, *Wynd & Mueller 201* (GH); Cañon de Jara, east of Socorro, *Schroeder 15* (GH); western base of Pecacho del Fuste, *Johnston 8427* (GH); 9 km. south of Parras, *Stanford, Retherford & Northcraft 152* (GH); 13 km. east of Jimulco, *Stanford, Retherford & Northcraft 112* (GH); Sierra del Pino, *Johnston & Muller 392; 756* (GH); 2 km. west of Las Margaritas, *Stewart 2844* (GH); Valle de Acatita, *Stewart 2997* (GH). **Durango**: Trancas Canyon, about 7 miles southeast of Chocolate, *Correll & Johnston 20015* (GH, TRF); 74 miles northeast of Durango, *Rollins & Tryon 58280* (GH); between Guadalupe Victoria and Cuencame, 87 miles northeast of Durango, *Rollins & Tryon 58283* (GH). **San Luis Potosi**: 50 miles northeast of San Luis Potosi, *Rollins & Tyron 58200* (GH). **Hidalgo**: between Ixmiquilpan and river cut on road to Cardonal, *Moore & Wood 3728* (GH).

2b. **S. Greggi** var. **hispidula** Rollins, Madroño 5:133. 1939.

We have seen this variety growing on limey gravel 16 km. southeast of San Luis Potosi where we were led by Dr. Jerzy Rezdowski in November, 1958. The plants have the hispid siliques and broad replum of the type specimen, but I cannot find any other characters to distinguish them from var. *Greggii*. In the same area we found *Lesquerella Schaffneri*,

whose type Schaffner also obtained in the area around San Luis Potosi, probably in the San Miguelito Mountains, which was one of his favorite collecting grounds. Our collection is *Rollins & Tryon 58208* (GH).

3. **Synthlipsis densiflora** Rollins, sp. nov. Fig. 3A-3E.

Perennial, caespitose; root caudex thick and often clothed with old leaf-bases; stems erect to somewhat decumbent, usually branched above, densely pubescent with irregular dendritic trichomes, arising from the crown amid a cluster of erect petiolate leaves, 1-2 dm. long; basal leaves petiolate, irregularly dentate to somewhat lobed, 5-10 cm. long, 2-4 cm. wide, pubescent throughout with dendritic trichomes, blade obovate to broadly elliptical, obtuse at apex; cauline leaves cuneate to obovate, usually petiolate, sparsely dentate, obtuse at apex, densely pubescent, 1.5-4 cm. long, 8-20 mm. wide, often subtending branches; inflorescence dense, terminating the main axes and the branches; sepals densely pubescent, narrowly oblong, ca. 5 mm. long, ca. 1 mm. wide, outer pair slightly saccate, inner pair nonsaccate; petals obovate with a slender claw, white, 7-9 mm. long, ca. 4 mm. wide; stamens shorter than petals; anthers ca. 2 mm. long; fruiting pedicels straight, at right angles to rachis to slightly ascending, densely pubescent, 5-10 mm. long, somewhat expanded at summit; siliques oblong to elliptical in outline, notched at apex, densely pubescent, strongly flattened at right angles to the septum, 8-15 mm. long, 5-8 mm. wide, trichomes of the valves of markedly different sizes; valves glabrous on interior; sinus at apex of silique V-shaped, 1-2 mm. deep; replum glabrous, acute at apex; styles slender, glabrous, 1-2 mm. long; seeds plump, somewhat pear-shaped, wingless, ca. 1.2 mm. long; position of cotyledons not determinable from the available material.

Herba perennis caespitosa; caudicibus crassis; caulibus erectis vel decumbentibus ramosis pubescentibus 1-2 dm. longis; foliis radicalibus petiolatis dentatis vel sinuatis obovatis vel ellipticis obtusis dense pubescentibus 5-10 cm. longis, 2-4 cm. latis; foliis caulinis cuneatis vel obovatis 1.5-4 cm. longis, 8-20 mm. latis; inflorescentiis densis; sepalis anguste oblongis pubescentibus ca. 5 mm. longis, ca. 1 mm. latis; petalis obovatis vel late spathulatis albis 7-9 mm. longis, ca. 4 mm. latis; pedicellis rectis divaricatis pubescentibus 5-10 mm. longis; siliquis late oblongis vel ellipticis compressis dense pubescentibus 8-15 mm. longis, 5-8 mm. latis; stylis tenuibus glabris 1-2 mm. longis; loculis 6-8-ovulatis; seminibus pyriformibus exalatis.

Type in the Gray Herbarium collected from crevices of limestone on

FIG. 3. *Synthlipsis densiflora* Rollins. A — habit sketch, × ½: B — mature silique, × 2; C — replum, × 2; D — seeds, × 5, one seed in cross-section to show cotyledon position; E — trichomes, × 25.

exposed high west-facing cliffs just below the ridge-crest, southwestern end of the Sierra de la Fragua, a high limestone ridge with a forest of *Pinus pinceana*, 1-2 km. north of Puerto Colorado, western Coahuila, Mexico, Sept. 2, 1941, *I. M. Johnston 8740*.

Synthlipsis densiflora is at present known only from the type series which in itself shows considerable variation. For one thing, there is an unusual amount of abortive fruit on several of the specimens, but even taking this into account, the variation in the siliques, both as to length and width, is remarkably great. The plants as a whole vary greatly in size and one suspects that the cliff-crevices where they were found were not uniformly favorable for growth. The dense cluster of basal leaves and thick caudex invested with old leaf-bases, as found in *S. densiflora*, often characterize plants of cliff-crevices in arid areas and it is interesting to have a species of *Synthlipsis* adapting itself to this particular habitat. *S. densiflora* is most closely related to *S. Greggii* and differs from it mainly in the shape of the silique, the fact that it is a heavy rooted perennial, and in the short, dense inflorescence. Also, the flowers are smaller and the styles are shorter in *S. densiflora* than in *S. Greggii*. — GRAY HERBARIUM OF HARVARD UNIVERSITY.

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DISTRIBUTIONAL AND CYTOLOGICAL NOTES ON SALSOLA COLLINA[1]

RICHARD W. POHL AND JAMES P. GILLESPIE[2]

The Eurasian *Salsola collina* Pall. has been previously reported by Schapaugh (1958) from Minnesota, Colorado, and Iowa. At the time of this report, the only collection of this species from Minnesota was a specimen collected by Moore in South St. Paul in 1937. Field observations of this species during 1959 indicate that it is now well established and apparently vigorously spreading in Sherburne County, about sixty miles northwest of the original record. In late June numerous young seedlings and dead plants of the previous year were found near Monticello and along sandy roadsides in the vicinity of Sand Dunes Game Preserve. In July, the species was found in great abundance along the railroad and newly graded embankment of Hys. 10 and 52 northwest of Becker, some ten to twelve miles from the earlier find. Citations of specimens collected at these localities are given below and specimens ultimately will be distributed to various herbaria.

Sandy roadside along highway 1.5 mi. n. e. of Monticello, Sherburne Co., Minnesota. Abundant at this locality and for several miles along sandy country roads near Sandhills Game Preserve. *Richard W. Pohl 7771*, June 19, 1959 (ISC).

Abundant on road shoulders and railroad right-of-way, along Hys. 10 and 52, 4.5 mi. n. w. of Becker, Sherburne Co., Minnesota. Plants monopodial, later producing lateral branches. Dark green, up to 2 ft. tall, *Richard W. Pohl 8017*, July 20, 1959 (ISC).

In general appearance, *S. collina* resembles the common Russian thistle, *S. kali* var. *tenuifolia*. However, the young plants possess a strong erect monopodial stem and later become bushy by the growth of basal branches. This growth

1 The facilities of the Iowa State University Herbarium, supported by the Industrial Science Research Foundation, were used in the preparation of this paper.

2 National Science Foundation teacher research participant, I. S. U. 1959. Expenses of publication were borne by the National Science Foundation.

habit is in striking contrast to that of the common Russian thistle, which has a more diffuse branching pattern. With a little practice it is easy to separate the two at a distance from a moving car.

The original Iowa collection of *S. collina*, made in 1957, was a scrap of a dead and dry plant. The species was apparently very rare in Ames at that time. This year the original colony has spread considerably and contains hundreds of plants, which are thriving on the dry slag and cinders of the railroad embankment. Apparently *S. collina* is well adapted to midwestern conditions and may become as aggressive a weed as *S. kali* var. *tenuifolia*.

Gametic chromosome numbers in the genus *Salsola* are

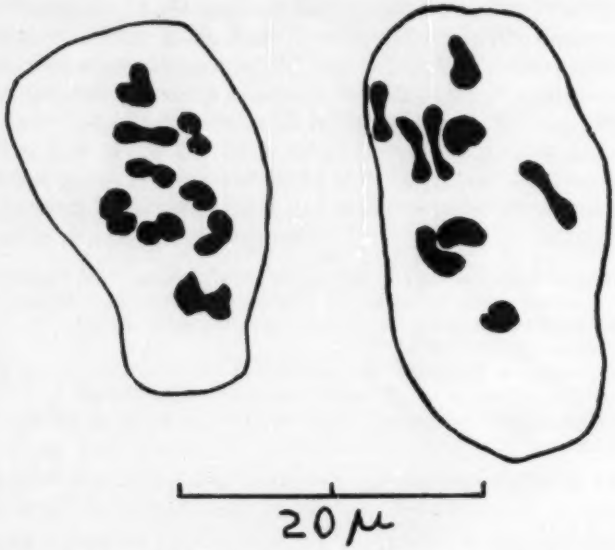

FIG. 1. *Salsola collina* Pall. Diakinesis in pollen mother cells, showing 9 pairs of chromosomes.

N = 9 (Reese, 1957) and N = 18 (Wulff, 1936, 1937). *S. kali* is a tetraploid with 18 pairs.

The gametic chromosome number of *S. collina* was determined from pollen mother cells as N = 9 (Fig. 1). The determination was made from plants grown in the greenhouse from wild seedlings collected at the Ames locality. It was found that the anther walls contained large numbers of druses which prevent proper flattening of aceto-carmine squash preparations. Efforts to dissolve the druses with versene or hydrochloric acid failed. In order to get sufficient flattening of squashes, it was necessary to remove all fragments of the minute anthers.

A voucher specimen for the above chromosome count is preserved in the Iowa State University Herbarium. The pertinent data are: cultivated in I. S. U. greenhouse, Ames, Story County, Iowa. Grown from wild seedlings taken at 6th St. overpass of C. & N. W. R. R., Ames. Chromosome number N = 9 from P. M. C.'s. July 26, 1959. *James P. Gillespie 1293A* (ISC).

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SOME ADDITIONS TO THE VASCULAR FLORA OF NEW HAMPSHIRE. — The presence of the following species in New Hampshire as indigeuous or naturalized and well established components of the flora will necessitate some revision of the statements of their ranges in Gray's Manual.

Aristida tuberculosa Nutt. This distinctive grass was found on September 17, 1958 by the authors in the township of Seabrook. It occurred along with *Andropogon scoparius* as scattered but very conspicuous individuals on the sandy area that lies between the highway at Seabrook Beach and the marshes of Blackwater River. Only a few collections have been made of this species north of Connecticut though apparently it is common on Plum Island. Also it has been collected at Winter Pond, Winchester and in Winthrop. These seem to be the only stations for it in Massachusetts. Apart from its occurrence on coastal sands *Aristida tuberculosa* turns up again near Lake Michigan and in Minnesota and Iowa. Its absence from Cape Cod, where conditions would seem to be ideal for it raises an interesting question in plant distribution.

Crotalaria sagittalis L. A number of plants of the Rattlebox were seen by the authors on September 11, 1958 in the township of Nashua not far from the Merrimack River in sandy soil. The discovery of this species in New Hampshire for the first time comes as no great surprise for it has been collected in the adjacent township of Tyngsboro as well as in numerous other Massachusetts localities in Middlesex and Essex Counties. In view of its occurrence in extreme southeastern Vermont it might also be expected in nearby parts of southwestern New Hampshire.

Arabidopsis Thaliana (L.) Heynh. The Mouse-ear Cress occurs here and there in the vicinity of the highway that winds its way toward Newmarket not far from the shores of Great Bay. It grows both in open grassy situations and among ledge-outcrops in varying degrees of shade beneath deciduous trees. The species has at least held its own during the years since 1938 when the junior author first found it.

The question of what constitutes naturalization should be considered in respect to this Durham record. A collection of *A. Thaliana* made by A. S. Pease from a henyard in Exeter in 1913 is present in the herbarium of the New England Botanical Club. Fernald may have felt that one such collection was insufficient to demonstrate even an adventive status. In any event Gray's 8th edition gives the range only to Massachusetts. Here in Durham we have a very different situation: the species is found in considerable quantity in a variety of ecological niches and it has reproduced itself satisfactorily for at least 20 years.

Hackelia americana (Gray) Fern. This was discovered by the authors, on a trip under the leadership of Professor A. S. Pease, in Dartmouth College Grant. Previously Professor Pease had found the only New Hampshire station of *Draba lanceolata* Royle on the cliffs of the Diamond Peaks in the Grant. *Hackelia* was found on a talus slope below the cliffs. Both *Draba* and *Hackelia* are essentially northern and calcareous in their affinities. There is one station of *Draba* in Maine, in southeastern Piscataquis county, and two stations in northern Vermont. *Hackelia* is rare in New England, occurring very locally south to central Maine and central Vermont. It is frequent in the calcareous areas of Gaspe. It seems probable that the Diamond Peaks have more available calcium than most New Hampshire rocks.

Uvularia perfoliata L. Sumners Falls in Plainfield long has been known as a station for certain calcophiles, such as *Astragalus alpinus* L. and A. *Jesupi* (Egglest. & Sheld.) Britt. A half a mile back from the Connecticut River in Plainfield, the senior author located a stand of mixed hardwoods containing *Uvularia perfoliata* L., *Dentaria laciniata* Muhl., *Orchis spectabilis* L. and some other plants that are rare in New Hampshire. *Uvularia perfoliata* is well distributed in Massachusetts and infrequent in southern Vermont. Its occurrence in Plainfield, which is almost the northern limit, as well as the first state record, may perhaps be accounted for

by the fact that the rich calcareous woods provide an unusually favorable site.

Dentaria laciniata Muhl. In addition to the station mentioned above, it also occurs on the talus slope of a cliff in Rumney.

Specimens of all the plants mentioned above have been placed in the New England Botanical Club. — FREDERIC L. STEELE AND A. R. HODGDON, ST. MARY'S-IN-THE MOUNTAINS, LITTLETON, N. H. AND UNIVERSITY OF NEW HAMPSHIRE, DURHAM, N. H.

A NEW MANUAL FOR CALIFORNIA[1]. — The best known work and until now the standard manual covering the entire flora of California has been that of Jepson[2] finally published in 1925. There have been several reissues, since the original, of Jepson's important work and these have served their users well in the decades from 1925 to the present. But even at the time of its appearance, certain limitations in Jepson's Manual were made evident by the fuller and more inclusive treatments of various groups of plants in the parts of several volumes of his own "A Flora of California" then being published. Abrams' Illustrated Flora of the Pacific States, of which we have seen three volumes [the fourth and last volume is nearly ready for release under the authorship of Mrs. R. S. Ferris] has also pointed up the need for improved treatments of various plant groups over the presentation in Jepson's Manual. Officially, the newly published "A California Flora" does not replace Jepson's Manual. However, practically, it does just that and it is as a replacement of the well known Jepson's Manual that we shall consider it in the present review.

Traditionally, a flora or manual attempts to be a guide to the plants growing in a given area. It provides finding-guides in the form of keys to the families, genera, species

1 A California Flora by Philip A. Munz in collaboration with David D. Keck. 1-1681. University of California Press, Berkeley and Los Angeles. 1959. $11.50.

2 A Manual of the Flowering Plants of California by W. L. Jepson. 1-1238. 1925.

and infraspecific taxa, along with descriptions, habitat notes and information on geographical distributions. A California Flora provides all of these items and in addition gives an indication of the plant community to which the particular taxon belongs and its chromosome number, if that is known. In any early section of the book, five biotic provinces, eleven vegetation types and twenty-nine plant communities are described for California. These subdivisions form the basis for the placing of the taxa into plant communities, as one finds in the write-up of each species, subspecies or variety.

In a volume such as the one under review, the quantity of material included is of such a vast scope that no casual appraisal of it is possible. The proof of the book's value will come only with the demonstrated effectiveness of its service to the user over a period of time. Not all parts of the book will prove to be equally sound, as the author himself predicts, because of the differences in the available information about the various groups of plants treated, if for no other reason. But several different persons did provide the treatments for different genera and parts of families which is bound to produce some unevenness in the book overall. However, this does not detract much, if any, from the book and I predict that a very high percentage of the family treatments will stand up well over the years ahead.

Dr. Munz and his collaborators, to a surprising degree, have availed themselves of modern treatments wherever they could be found. In general, they have accepted the new treatments, yet there has been maintained an overall conservative tone in the book, showing a decided sifting and distilling of conflicting evidence where controversial matters are concerned.

Perhaps the most radical departure in the organization of the book under review, as compared to similar ones, is the abandonment of the Engler and Prantl sequence for the families of the Angiosperms. The new arrangement will be acknowledged to reflect more nearly the presently accepted phylogenetic sequences than the outdated traditional ar-

rangement but it is certain that those familiar with the old arrangement, both in herbaria and in other manuals, will be frequently fumbling in the wrong part of this book for a particular family. The break with tradition in this respect is justified if the presentation of a truer conception of plant relationships is achieved, even though we may regret the loss of the familiar, more convenient arrangement.

As compared with Jepson's Manual, which delineates a total of 4019 species, A California Flora purports to cover, "6,000-odd kinds of plants growing spontaneously in California", according to notes provided on the jacket cover. Since the figures are not comparable, one including only the species and the other inclusive of all "kinds", presumably species and infraspecific taxa, they cannot be compared directly. However, it is clear that a considerable number of presumed taxa not included in Jepson are treated in the Munz book. This is to be expected because of the continued botanical exploration and increased study of the plants of California since 1925. Furthermore, there have been a good many introductions into the California flora during the same period. Some notion as to the increased number of species recognized in the new flora may be obtained by comparing a few of the representative genera with mostly indigenous species, as shown in the following table.

NUMBERS OF SPECIES

GENUS	JEPSON	MUNZ	GENUS	JEPSON	MUNZ
Carex	126	144	Potentilla	44	26
Poa	29	36	Lupinus	65	82
Calochortus	24	37	Lomatium	23	35
Allium	27	38	Phacelia	55	87
Eriogonum	66	76	Penstemon	37	58
Arabis	20	35	Erigeron	32	46
Ribes	26	31	Senecio	33	38

It should not be inferred that because in all but one of the genera listed above there is an increased number of species recognized, a lack of restraint in the recognition of described species characterizes the new manual. Rather, insofar as I

can judge, it appears that the increased number of species recognized merely reflects a more accurate coverage of the plants of the area than heretofore. Thus viewed, one sees that the new book was definitely needed and those interested in California plants should find it to be a considerable improvement over Jepson's Manual. In turning from the old to the new, students will not mind leaving behind the confusing English line that was used for short dimension measurements throughout the older work, but they will miss the many pertinent illustrations. Munz' Manual has a rather minimal number of illustrations. Those present are of good quality, but there are too few to be of any real importance to the book as a whole. The book is well manufactured and well printed. The inevitable slips are to be found, such as the page references being upside down for groups 3 through 5 on page 68, but these seem to be at a minimum.

A California Flora is a notable addition to the growing list of state floras in the United States and because of the high endemism in that flora, there is more justification for the use of the state boundaries to delimit the area of coverage than in most state floras. This book is among the best of its kind and every serious botanist interested in the plants of the California area will want a copy near at hand. — REED C. ROLLINS, GRAY HERBARIUM OF HARVARD UNIVERSITY.

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